With heavily committed funding, when the first criterion of success is that you need a bigger computer, it is evidently difficult to say that we now understand the relation between processes so well that we can present them in more compact form, and therefore we do not need that computer after all. But isn't understanding things what the philosophy of science is all about?

The exceptions stand out, such as that tropical clouds reflecting about as much radiation as they fail to re-radiate from their cold tops 'may be fortuitous', or Feynman's quip about dynamical meteorologists concerned with the flow of dry water. Bravo! There is a hint of parochialism. Ludlam's *Clouds and storms* does not appear in the cloud physics references, perhaps because he envisaged a larger context and thought that cloud microphysics played a minor role in determining the structure of clouds?

Although many diagrams are drawn specially for this publication I often found myself wanting to refer back to the originals to understand quite what was plotted; monthly rainfall in units of 'mm (at first day)' had me puzzled for a time. Some of the diagrams are almost useless, perhaps because they were reproduced in monochrome from colour-coded computer plots, which ought to be banned anyway (together with those forests of alleged arrows, that dynamic meteorologists sometimes produce). But apart from technical variations, attitudes are contrasting. Some articles are masterly but evasive, many contain valuable information: the average depth of a river is 1·5 cm; we know the global average heat flux give-or-take 10^{15} W; existing global data may be reanalysed each 5–10 years, using the latest numerical model; it would take 10^{10} year to generate the oceans from water from the core (but from where else?).

An essential book for the library, but no poetry. Waters above, but no eternal springs . . .

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ARIDITY, DROUGHTS AND HUMAN DEVELOPMENT by Monique Mainguet, Springer, Berlin 1999. No. of pages. 302. Price: DM 149·00, £ 57·50. ISBN 3 540 63342 1

The book is a translation of the French version *L'Homme et la Secheresse* published in 1996. It commences with a series of questions concerning dryland environments, which, it is argued, remain to be answered. The author asks if drylands are desiccating, are droughts becoming more virulent, and why have development attempts failed? Such questions have been asked in the past, especially in the 1980s, and one measure of the book's value is whether any new insights and answers can be provided. The book's aims suggest how this will be tackled.

The aim of the book (p. vi) 'is to illustrate convincingly the primordial importance of the factor environment in development.' This stance raises the spectre of environmental determinism but I am in agreement with the author in that it is time for some re-evaluation of the significance of the physical environment in drylands. Perhaps too much attention has been paid to the role of human, especially economic, systems leading to the disregard of environmental influences. Whether the environment is of 'primordial importance' is however a matter for further discussion, which is beyond the scope of a book review.

The rationale for the book is the premise that drylands cover a large proportion of the Earth's surface where the development of water resources is problematic and increasingly difficult in the face of demographic change, climate change and frequent droughts. Much of the material is challenging and this is not an 'entry-level' text to the study of drylands. It is full of detailed analyses and case studies from various parts of the arid realm. It is provocative in places and should appeal to a broad range of dryland specialists. For example, a plea is made for the re-introduction of zonal (regional) geography and for 'geohistory' which (p. 3) 'forces a scientist to consider the geographical environment before looking at the historic situation.' Thus the book is divided into four major sections dealing with:

- spatial framework (physical geography)
- environmental constraints (water and wind)
- geohistory (development of societies)
- decline (degradation of environment and economic system).

I found the earlier sections to be a mixture of some rather mundane descriptions of the physical conditions alongside some interesting discussions of the nature of environmental change. The book is then rather uneven in its content. Was it really necessary to have so much information on dryland soils? Why include wind in a text on water resources, aridity and drought?

The key characteristics of drought and aridity are described and the author, rightly in my opinion, distinguishes between aridity as a permanent water deficit and drought as a temporary phenomenon. She further identifies various different forms of drought from agricultural to meteorological. It was disappointing then to see an analysis of drought conducted solely on precipitation, i.e. meteorological drought. I had hoped to learn more about edaphic and agricultural droughts.

The two key physical processes of drylands are taken to be hydrological and aeolian. There is a systematic presentation of hydrological characteristics and their associated environmental problems from soil erosion to flash floods. Similarly the action of wind is discussed in detail with an emphasis upon soil erosion and sand dune classification. This will appeal to arid land geomorphologists but I would like to have seen clearer links to drought and aridity, e.g. more discussion of the importance of soil moisture. Having established the nature of the physical environment, the author seeks to explain the various ways in which humans

have adapted to these conditions. The fundamental principles of rainfed agriculture and pastoralism are presented in a 'traditional' fashion where humans adapt to environmental constraints by various strategies. The evolution of hydraulic civilizations is described, while twentieth century changes such as sedentarization, well digging and emphasis upon cash crop production are used to explain the demise of traditional landuse practices. Yet in a region such as the Sahel there is questionable evidence of falling livestock numbers and agricultural production has increased over the last two decades. There is then limited critical evaluation of the ideas presented, in particular the concept of carrying capacity is not challenged nor are ideas of disequilibrium introduced until the final pages of the book (p. 256). I suspect that many dryland scientists will question the description of agricultural degradation presented here.

Irrigation and surface storage are discussed in some detail with useful case study material. In contrast, clouding seeding, desalination and inter-basin transfers are dismissed within one page. I could find little on artificial groundwater recharge, nor any ideas of water conservation and demand mangement. The author has then focused largely on current water resource practices with a focus of supply enhancement despite their known environmental impacts and limited sustainability, although the discussion of runoff harvesting was welcome.

The book concludes with an interesting discussion of 'decadence' in the drylands, which is presented as a process from development where there was an 'equilibrium between man and his environment' (p. 203) to a collapse of this equilibrium followed by degradation. Ten perspectives are presented including the naturalist, the marxist and the neo-colonialist, which provide differing explanations of who or what is to blame. Oases are employed to demonstrate the resilience of some dryland systems and their ability to adapt and mutate and four case studies concerning the problems of irrigation are presented. Problems of salinization lead inexorably to a discussion of desertification. It is probably appropriate to end a text on drought and aridity by looking at irrigation but I felt there was a lack of coherence in this final section.

This is an informative book on dryland environments with an emphasis upon geomorphological conditions. I support the general stance that those involved with developing such areas need a thorough understanding of the environmental systems and that an integrated approach is required that combines environmental science with socio-economic understanding. Most of my critical comments arise from the title of the book which I feel is somewhat misleading. I would like to have learned much more about climate change, desiccation and droughts. I was not convinced that the detailed discussion of wind linked to the aims of the text, and the discussion of human occupation was rather 'traditional'. Nevertheless this is a challenging read, it contains many provocative statements, and I would expect to see it on the reading list of any drylands course. I felt the overall approach was uneven and I have questioned the inclusion of some material but this is a book that I shall read again and I suspect that I will have many reasons for referring back to some key sections.

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